

RF MEASUREMENT REPORT

FCC ID: 2AXPS523A623AWPC
Applicant: BCS Automotive Interface Solutions (Suzhou) Co., Ltd.
Product: WPC
Model No.: 523A/623A WPC
FCC Classification: Part 15 Low Power Communication Device Transmitter (DXX)
FCC Rule Part(s): Part 15 Subpart C (Section 15.225)
Test Date: 2022-09-27 ~ 2022-09-29
Test Result: Complies

Reviewed By:

Sunny Sun

Approved By:

Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2209RSU055-U2	Rev. 01	Initial Report	2022-11-15	Valid

CONTENTS

Description	Page
1. General Information	5
1.1. Applicant	5
1.2. Manufacturer.....	5
1.3. Testing Facility	5
1.4. Product Information	6
1.5. Radio Specification under Test.....	6
2. Test Configuration.....	7
2.1. Test Mode.....	7
2.2. Test Configuration and Software	7
2.3. Applied Standards	7
2.4. Test Environment Condition	7
3. Antenna Requirements	8
4. Measuring Instrument.....	9
5. Decision Rules and Measurement Uncertainty	10
5.1. Decision Rules	10
5.2. Measurement Uncertainty	10
6. Test Result	11
6.1. Summary	11
6.2. In-band Emission Measurement.....	12
6.2.1. Test Limit.....	12
6.2.2. Test Procedure.....	12
6.2.3. Test Setting	12
6.2.4. Test Setup	13
6.2.5. Test Result	13
6.3. Out-band Emission Measurement	14
6.3.1. Test Limit.....	14
6.3.2. Test Procedure.....	14
6.3.3. Test Setting	14
6.3.4. Test Setup	15
6.3.5. Test Result	16
6.4. Occupied Bandwidth Measurement.....	17
6.4.1. Test Limit.....	17
6.4.2. Test Procedure.....	17
6.4.3. Test Setting	17

6.4.4.	Test Setup	18
6.4.5.	Test Result	18
6.5.	Frequency Stability Tolerance Measurement	19
6.5.1.	Test Limit	19
6.5.2.	Test Procedure	19
6.5.3.	Test Setting	19
6.5.4.	Test Setup	20
6.5.5.	Test Result	20
6.6.	AC Conducted Emissions Measurement	21
6.6.1.	Test Limit	21
6.6.2.	Test Setup	21
6.6.3.	Test Result	21
Appendix A - Test Result		22
A.1	In-band Emission Test Result	22
A.2	Out-Band Emission Test Result	23
A.3	20dB Bandwidth Test Result	24
A.4	Frequency Stability Tolerance Test Result	25
A.5	AC Conducted Emissions Test Result	26
Appendix B - Test Setup Photograph		27
Appendix C - EUT Photograph		28

1.4. Product Information

Product Name	WPC
Model No.	523A/623A WPC
Test Sample ID.	20220922Sample#01
WPT Specification	127.7KHz
NFC Specification	13.56MHz
Operating Temp.	-40 ~ 85°C
Input Voltage	DC 12V
Output	15W (MAX)
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Radio Specification under Test

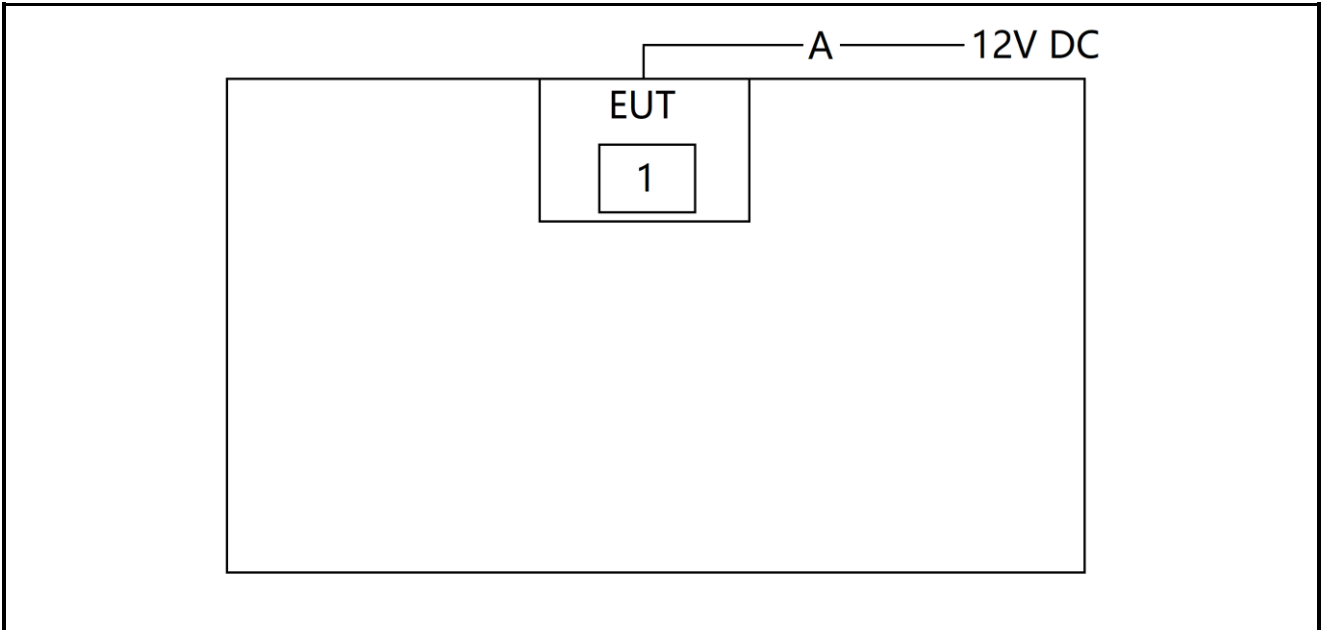
Frequency Range	13.56MHz
Type of modulation	ASK
Antenna Type	Coil Antenna

2. Test Configuration

2.1. Test Mode

Test Mode
Mode 1: Transmit by NFC

2.2. Test Configuration and Software



Cable Type	Cable Description	Length
A	DC Power Cable Non-Shielding	3.0m
Product	Manufacturer	Model No.
1	NFC Card N/A	N/A

2.3. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15.255
- ANSI C63.10-2013

2.4. Test Environment Condition

Ambient Temperature	15 ~ 35 °C
Relative Humidity	20 ~75 %RH

3. Antenna Requirements

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antenna of this device is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

4. Measuring Instrument

Instrument Name	Manufacturer	Model No.	Asset No.	Cali. Interval	Cal. Due Date	Test Site
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2022-12-29	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2023-08-22	WZ-AC1
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2022-11-12	WZ-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2023-06-21	WZ-AC1
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2023-04-21	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2023-06-06	WZ-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2022-12-29	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE11039	1 year	2022-11-11	WZ-AC1
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2022-10-28	WZ-AC1
Temperature Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2022-10-10	WZ-TR3
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2023-06-06	WZ-TR3
Signal Analyzer	Keysight	N9010B	MRTSUE07027	1 year	2022-12-05	WZ-TR3

Software	Version	Function
EMI Software	V3	EMI Test Software
Controller_MF 7802	2.03C	RE Antenna & Turntable

5. Decision Rules and Measurement Uncertainty

5.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.2. Measurement Uncertainty

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

AC Conducted Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): Horizontal: 9kHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 9kHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB

6. Test Result

6.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Verdict
15.225 (a), (b), (c)	In-Band Emission	Radiated	Pass
15.225(d)	Out-Band Emission		Pass
15.215 (c)	20dB Bandwidth		Pass
15.225(e)	Frequency Stability Tolerance		Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	N/A

Remark:

1. For radiated emission tests, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.
2. "N/A" means not applicable.

6.2. In-band Emission Measurement

6.2.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.225		
Frequency (MHz)	Distance (m)	Level ($\mu\text{V/m}$)
13.553 ~13.567	30	15848
13.410 ~13.553, 13.567 ~13.710	30	334
13.110 ~13.410, 13.710 ~14.010	30	106

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: $E \text{ field strength (dB}\mu\text{V/m)} = 20 \log E \text{ field strength } (\mu\text{V/m)}$

6.2.2. Test Procedure

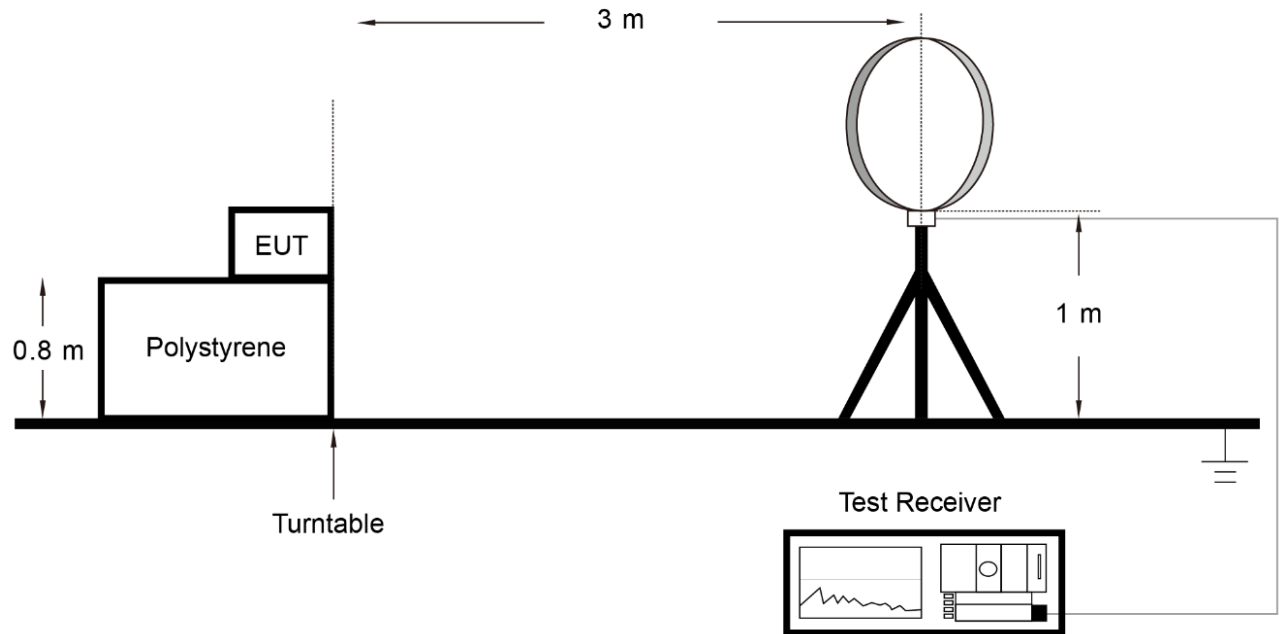
ANSI C63.10-2013 - Section 6.4.7

6.2.3. Test Setting

1. RBW = 9kHz
2. VBW = 3 * RBW
3. Detector = Peak
4. Trace mode = Max hold
5. Sweep = Auto couple
6. Allow the trace to stabilize

6.2.4. Test Setup

9kHz ~ 30MHz Test Setup:



6.2.5. Test Result

Refer to Appendix A.1.

6.3. Out-band Emission Measurement

6.3.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level ($\mu\text{V}/\text{m}$)
0.009 - 0.490	300	2400/F (kHz)
0.490 - 1.705	30	24000/F (kHz)
1.705 - 30	30	30
30 - 88	3	100
88 - 216	3	150
216 - 960	3	200
Above 960	3	500

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dB $\mu\text{V}/\text{m}$) = 20 log E field strength ($\mu\text{V}/\text{m}$)

6.3.2. Test Procedure

ANSI C63.10-2013 - Section 6.5.4

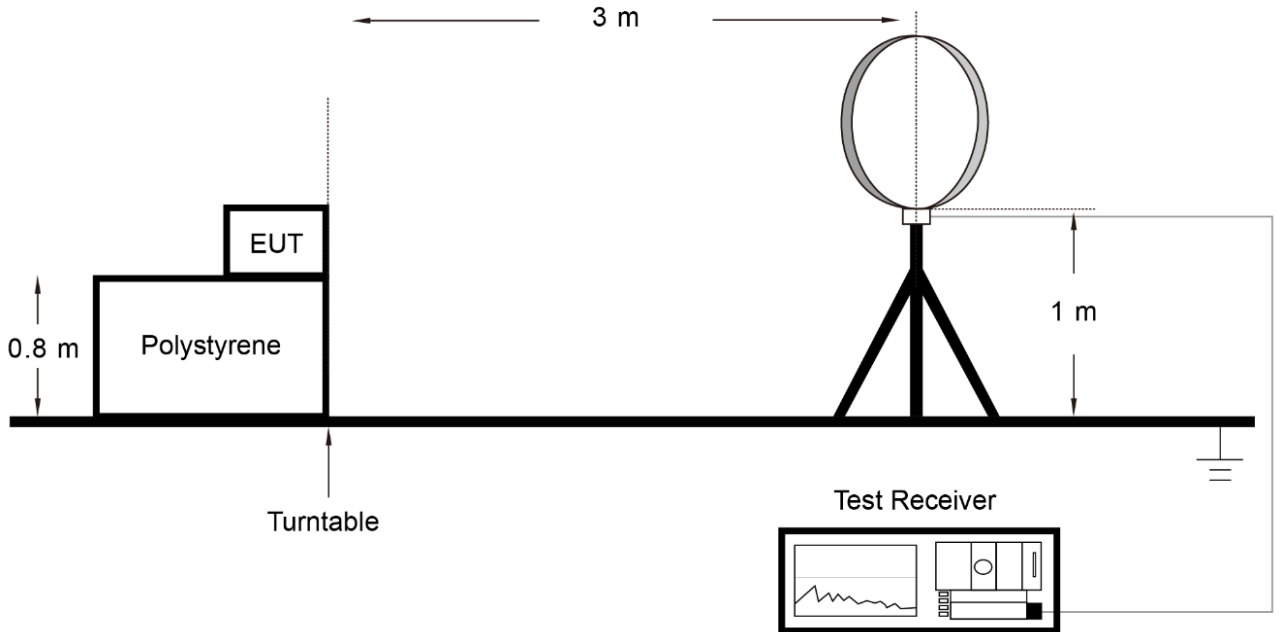
ANSI C63.10-2013 - Section 6.4.7

6.3.3. Test Setting

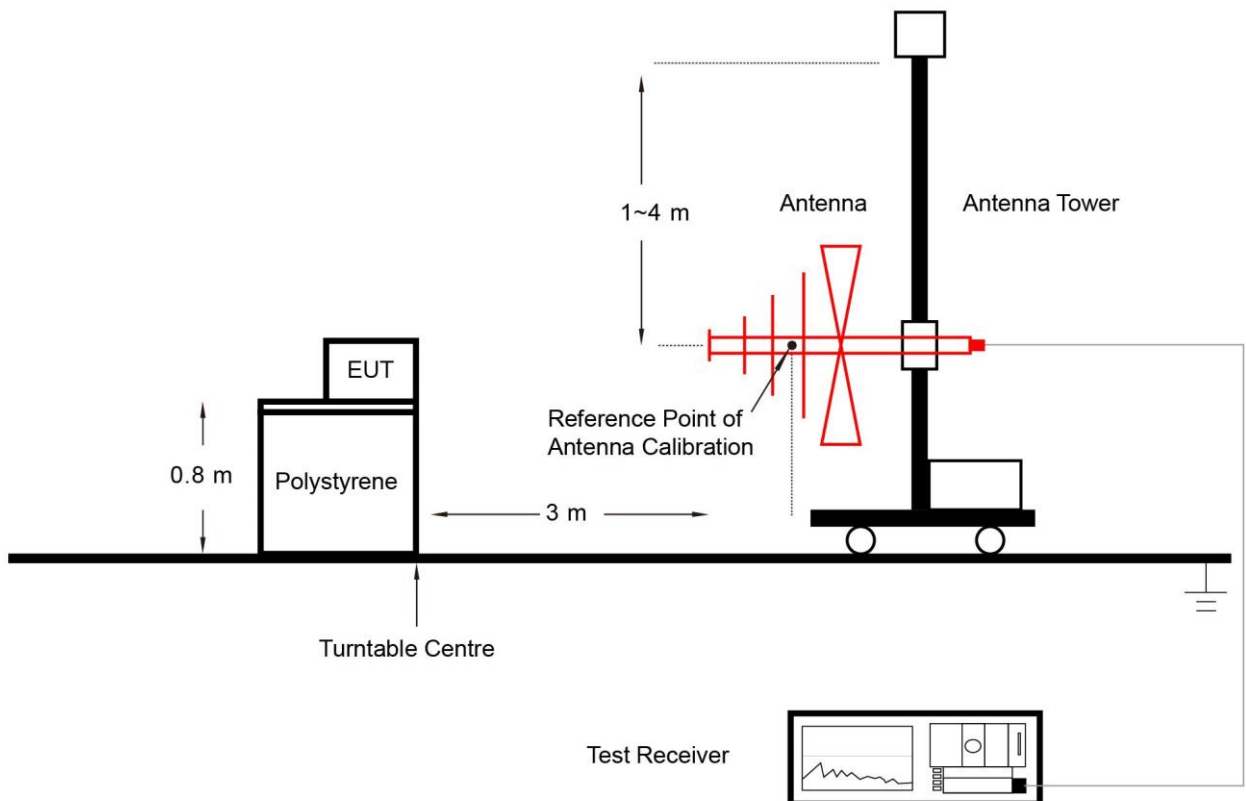
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 9kHz for emission below 30MHz and 100kHz for emission between 30MHz and 1GHz
3. VBW = 3 * RBW
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace to stabilize

6.3.4. Test Setup

9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



6.3.5. Test Result

Refer to Appendix A.2.

6.4. Occupied Bandwidth Measurement

6.4.1. Test Limit

The occupied bandwidth is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequency.

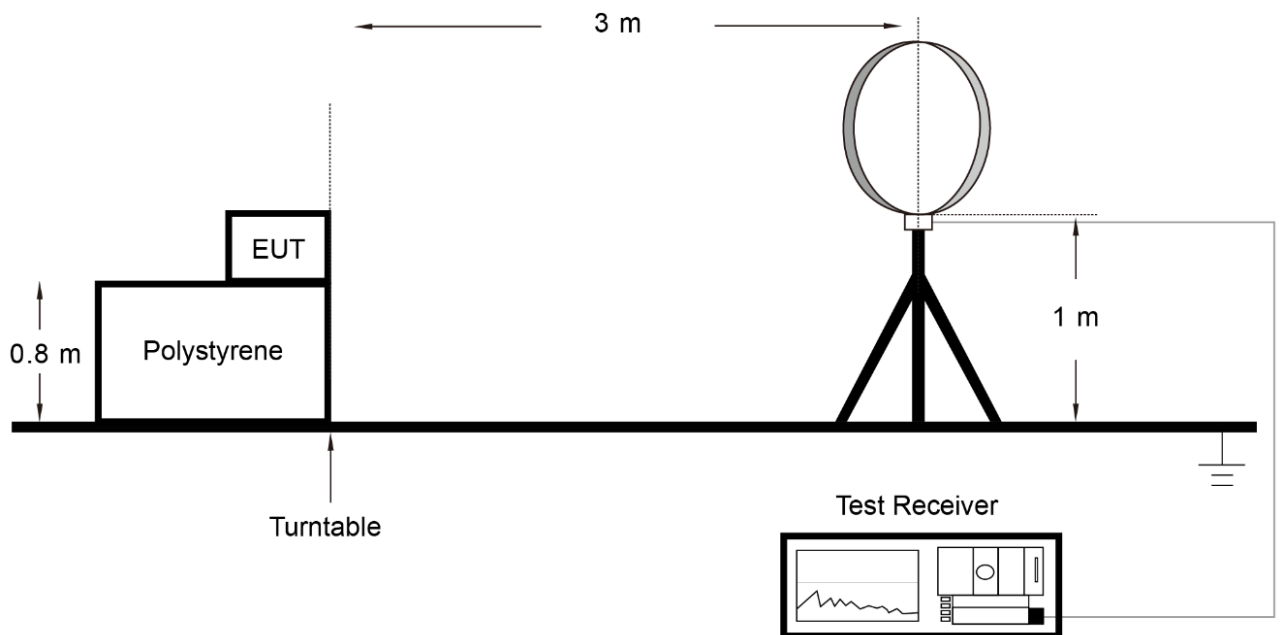
6.4.2. Test Procedure

ANSI C63.10-2013 - Section 6.9.2 (20dB Bandwidth)

6.4.3. Test Setting

1. Set RBW \geq 1% to 5% of the 20dB bandwidth
2. VBW = approximately three times RBW
3. Span = approximately 2 to 5 times the 20dB bandwidth
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace to stabilize
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.3.

6.5. Frequency Stability Tolerance Measurement

6.5.1. Test Limit

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency.

6.5.2. Test Procedure

ANSI C63.10-2013 - Section 6.8

6.5.3. Test Setting

Frequency Stability Under Temperature Variations:

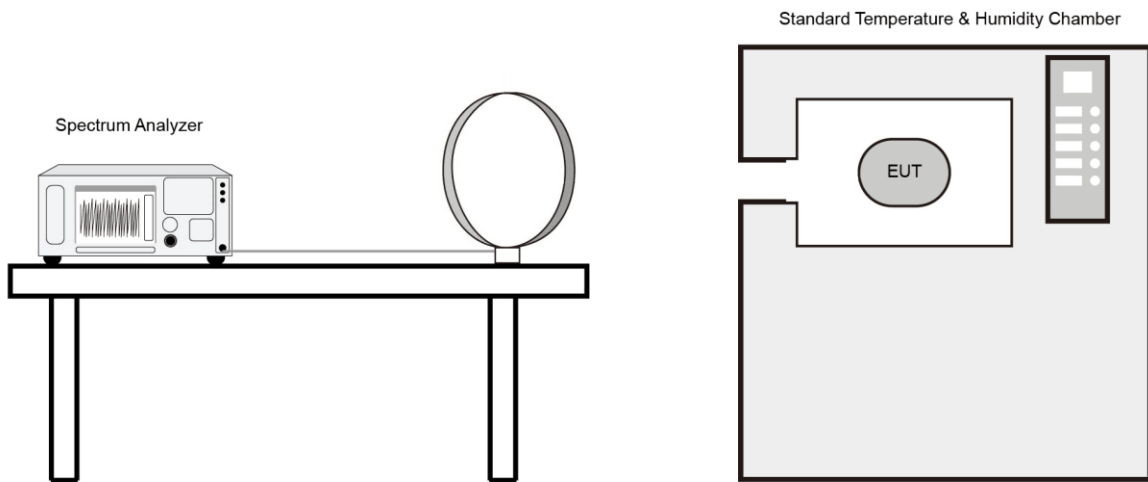
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation ($\pm 15\%$) and endpoint, record the maximum frequency change. For hand-carried battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

6.5.4. Test Setup



6.5.5. Test Result

Refer to Appendix A.4.

6.6. AC Conducted Emissions Measurement

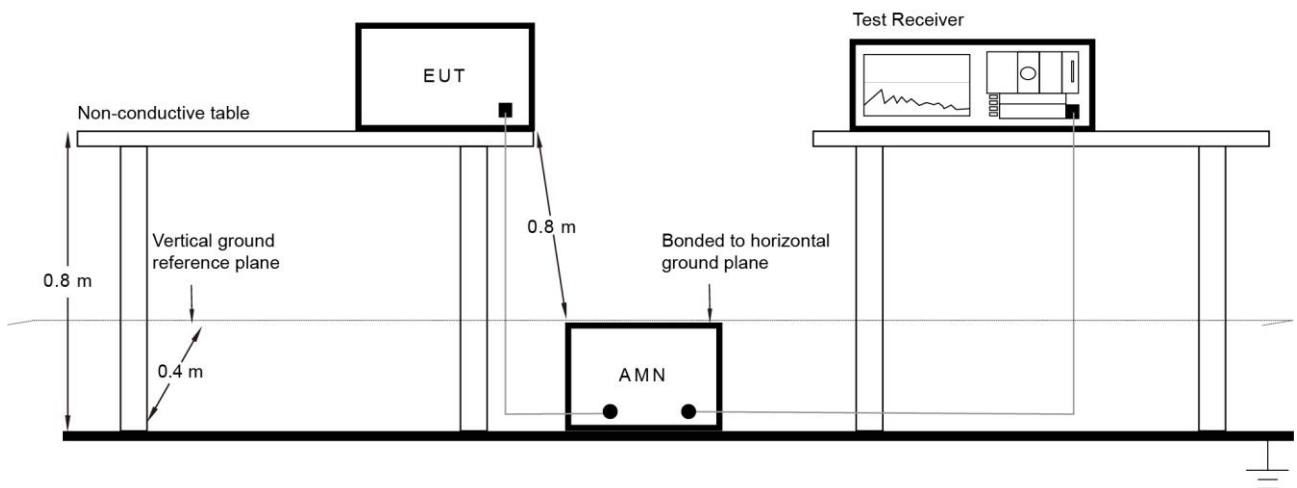
6.6.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207		
Frequency (MHz)	QP (dB μ V)	AV (dB μ V)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.6.2. Test Setup



6.6.3. Test Result

Refer to Appendix A.5.

Appendix A - Test Result

A.1 In-band Emission Test Result

Test Engineer	Carl Jiang	Test Date	2022-09-27
Test Mode	Mode 1	Test Site	WZ-AC1

Frequency (MHz)	Reading Level (dB μ V)	Factor (dB/m)	Measure Level (dB μ V/m)	Limit (@3m) (dB μ V/m)	Margin [dB]
Coaxial					
13.349	29.3	18.9	48.2	80.5	-32.3
13.553	31.5	18.9	50.4	90.5	-40.1
13.560	46.4	18.9	65.3	124.0	-58.7
13.567	32.6	18.9	51.5	90.5	-39.0
13.773	25.8	18.9	44.7	80.5	-35.8
Coplanar					
13.347	21.0	18.9	39.9	80.5	-40.6
13.553	28.5	18.9	47.4	90.5	-43.1
13.560	43.3	18.9	62.2	124.0	-61.8
13.567	29.5	18.9	48.4	90.5	-42.1
13.772	25.3	18.9	44.2	80.5	-36.3

Note 1: All measurements were performed using a loop antenna. The antenna was positioned in two orthogonal (coaxial and coplanar) and the position with the highest emission level was recorded.

Note 2: Measurements were tested at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear extrapolation factor (40 dB/decade) as specified in &15.31(f)(2).

Extrapolation Factor = $40 \cdot \log_{10}(30/3) = 40$ dB

For example, Limit (@3m) = $20 \cdot \log_{10}(106) + 40 = 80.5$ dB μ V/m

Note 3: All measurements were recorded using an EMI test receiver employing a peak detector.

A.2 Out-Band Emission Test Result

Test Engineer	Carl Jiang	Test Date	2022-09-27
Test Mode	Mode1	Test Site	WZ-AC1

Out-Band Emission Below 30MHz						
Frequency (MHz)	Reading Level (dB μ V)	Factor (dB/m)	Measure Level (dB μ V/m)	Limit(@3m) (dB μ V/m)	Margin (dB)	Detector
Coaxial						
1.374	14.1	18.9	33.0	64.9	-31.9	Peak
Coplanar						
0.643	18.7	18.9	37.6	64.9	-27.3	Peak

Out-Band Emission Above 30MHz							
Polarization	Frequency (MHz)	Reading Level (dB μ V/m)	Factor (dB)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
Horizontal	42.6	3.3	18.4	21.7	40.0	-18.3	Peak
Horizontal	58.1	3.4	17.6	21.0	40.0	-19.0	Peak
Horizontal	152.7	3.8	18.1	21.9	43.5	-21.6	Peak
Horizontal	320.0	4.0	19.1	23.1	46.0	-22.9	Peak
Horizontal	381.1	3.4	20.4	23.8	46.0	-22.2	Peak
Horizontal	667.3	1.8	26.3	28.1	46.0	-17.9	Peak
Vertical	37.8	5.4	18.0	23.4	40.0	-16.6	Peak
Vertical	95.0	6.5	12.6	19.1	43.5	-24.4	Peak
Vertical	156.6	3.5	18.2	21.7	43.5	-21.8	Peak
Vertical	252.1	3.6	16.7	20.3	46.0	-25.7	Peak
Vertical	351.1	4.5	19.5	24.0	46.0	-22.0	Peak
Vertical	578.5	4.1	24.9	29.0	46.0	-17.0	Peak

Note 1: Below 30MHz measurement was performed using a loop antenna. The antenna was positioned in two orthogonal (coaxial and coplanar) and the position with the highest emission level was recorded.

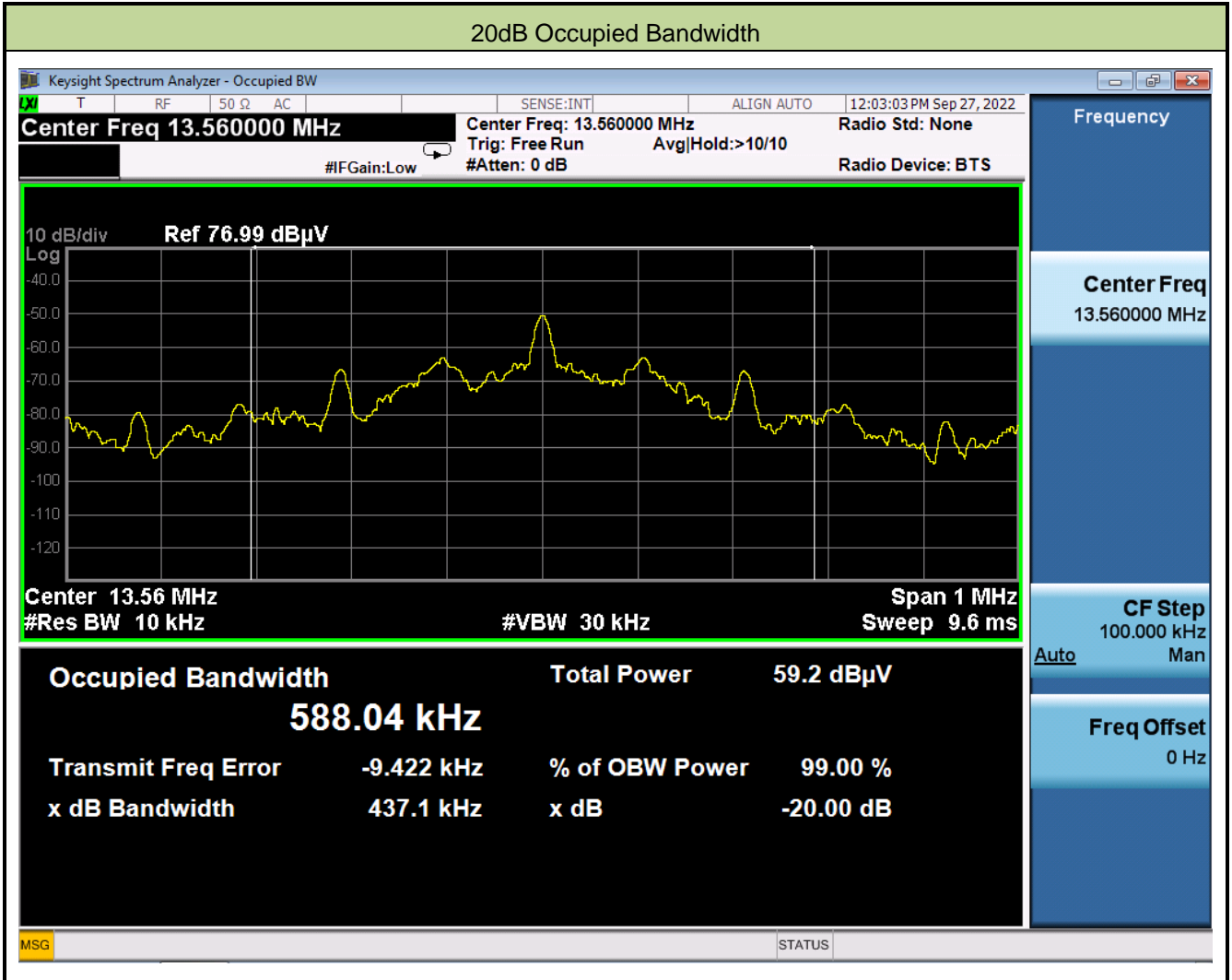
Note 2: Measurements were tested at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear extrapolation factor (40 dB/decade) as specified in &15.31(f)(2). Extrapolation Factor = $40 * \log_{10} (30/3) = 40$ dB

For example, Limit (@3m) = $20 * \log_{10} (30) + 40 = 69.5$ dB μ V/m

A.3 20dB Bandwidth Test Result

Test Engineer	Carl Jiang	Test Date	2022-09-27
Test Mode	Mode 1	Test Site	WZ-AC1

Frequency (MHz)	20dB Occupied Bandwidth (kHz)
13.56	437.1



A.4 Frequency Stability Tolerance Test Result

Test Engineer	Liz Yuan	Test Date	2022-09-29
Test Mode	Mode1	Test Site	WZ-TR3

Declared Frequency: 13.56 MHz						
Reference Voltage: 12Vdc						
Voltage (%)	Voltage (Vdc)	Temp (°C)	Measured Freq. (Hz)	Freq. Dev. (Hz)	Limit (Hz)	Result
100	12	-20	13559904.230	-95.770	-1356 ~ +1356	Pass
		-10	13560163.637	163.637	-1356 ~ +1356	Pass
		0	13560370.320	370.320	-1356 ~ +1356	Pass
		+10	13560181.836	181.836	-1356 ~ +1356	Pass
		+20	13560102.243	102.243	-1356 ~ +1356	Pass
		+30	13560084.403	84.403	-1356 ~ +1356	Pass
		+40	13560094.844	94.844	-1356 ~ +1356	Pass
		+50	13560376.594	376.594	-1356 ~ +1356	Pass
85	10.2	+ 20	13560190.697	190.697	-1356 ~ +1356	Pass
115	13.8	+ 20	13560149.559	149.559	-1356 ~ +1356	Pass

Note: Frequency Deviation (Hz) = Measured Frequency (Hz) - Declared Frequency (Hz)

A.5 AC Conducted Emissions Test Result

The EUT is powered by external DC source, so the item is not applicable.

Appendix B - Test Setup Photograph

Refer to "2209RSU055-UT" file.

Appendix C - EUT Photograph

Refer to "2209RSU055-UE" file.

_____ The End _____